

INTRODUCTION | THE CHALLENGE





The mining industry is beset by myriad issues, but some of the biggest of these are related to data.

Mining and exploration companies have mountains of data... the problems come in when that data needs to be reckoned with.

With the advent of AI, much of the industry's data is functionally useless – it's unstructured and non-standardized, and as such is unreadable by machines.

The biggest data challenges for the industry:

- 1. Unorganized and unstructured data
- 2. Non-standardized data
- 3. Data without interpretation
- 4. Data not "analytics ready" for AI systems

Minerva Intelligence has built a revolutionary suite of AI-powered solutions custom-tailored for the mining and exploration industry.

.

INTRODUCTION | THE SOLUTION

AI SOLUTIONS WITHIN REASON

SOLVING YOUR DATA MANAGEMENT, DRILLING & MINERAL EXPLORATION CHALLENGES WITH AI

THE STATS



Over 80% of the time in AI projects is spent dealing with and wrangling data



Geologists spend less than 20% of their time interpreting and analyzing data



Traditionally, only 5% of sampled elements are used in multi-element analysis

WHAT SETS US APART

We are a team of AI experts, software developers, geospatial analysts and geologists providing revolutionary AI solutions

Expertise

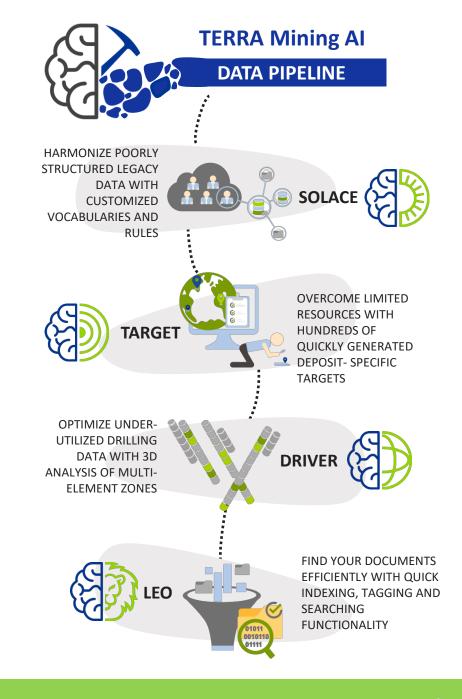
TARGET uses AI to eliminate bias and provide advice on optimum mineral targets

R.O.I.

DRIVER uses 100% of your drill-hole assay so you can make the most out of your data and, more importantly, your investment

Time Savings

SOLACE & LEO improve the quality of your data and search results with speed and efficiency. TARGET and DRIVER provide Aipowered assessments faster than a team of geologists



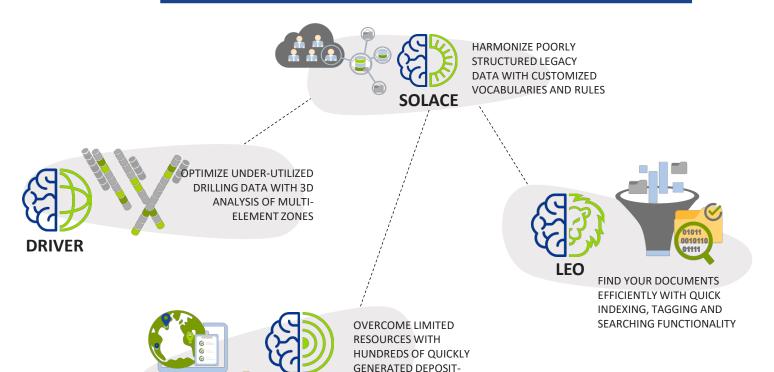
MINERVA INTELLIGENCE

AI SOLUTIONS WITHIN REASON





TERRA MINING AI



SPECIFIC TARGETS

SCALABLE SOLUTIONS

- Minerva's TERRA Mining AI suite is scalable, with solutions for every stage of the exploration and mining process
- Minerva's tiered plan can solve many problems that are pervasively occurring throughout the mining industry
- Clients that sign up for the first stage, SOLACE (data organization), are then ready for Minerva's deeper solutions: LEO (document management), DRIVER (multi-element analysis), and TARGET (drilling target generation)
- LEO is also available as a standalone application, with no need for a data organization step

TERRA | SOLACE OVERVIEW



PROBLEM

Companies have millions to billions of dollars of data that is unstructured and unorganized

SOLUTION

TERRA's SOLACE provides data organization, harmonization and standardization and gets data analytics-ready for AI and machine learning

TERRA MINING AI



Databases have info about rock type, texture, alteration, etc. These are commonly plagued with inconsistent labels, typos, and multi-lingual data garnite granite *Granite?* **GRAN Bt-granite** granita grt Qtz-grt Aligned to standard

SOLACE DEMO VIDEO (39min)

granite

TERRA | LEO OVERVIEW



PROBLEM

Companies have an overwhelming document repository but it is difficult to search and find information

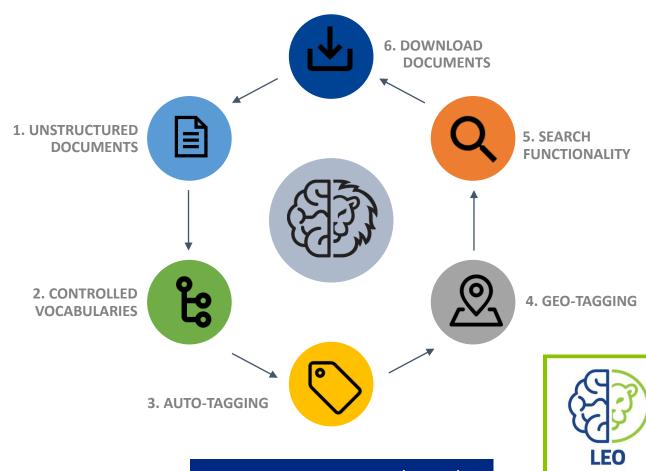
SOLUTION

Minerva's LEO automatically tags and geotags geological documents so they are easy to find, and the information contained therein becomes easy to extract

TERRA MINING AI



LEO Workflow



TERRA | DRIVER OVERVIEW



PROBLEM

Mineral exploration company collects a massive amount of drilling data but often only focus on the location and quantity of economic elements

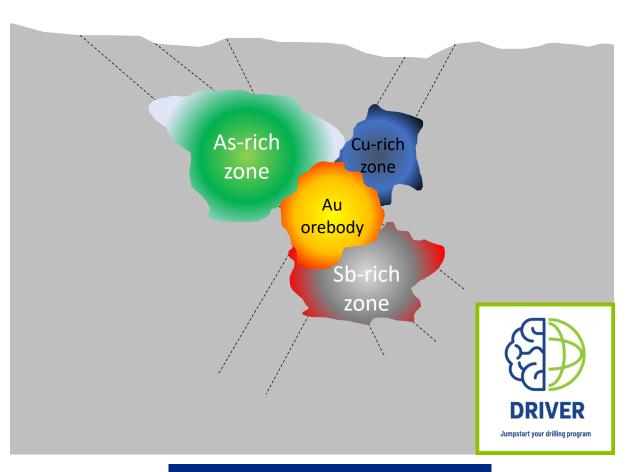
SOLUTION

Minerva's DRIVER software
evaluates the drilling data for multielement spatial patterns that have
exploration or geometallurgical
significance

TERRA MINING AI







DRIVER DEMO VIDEO (8min)

TERRA TARGET OVERVIEW



PROBLEM

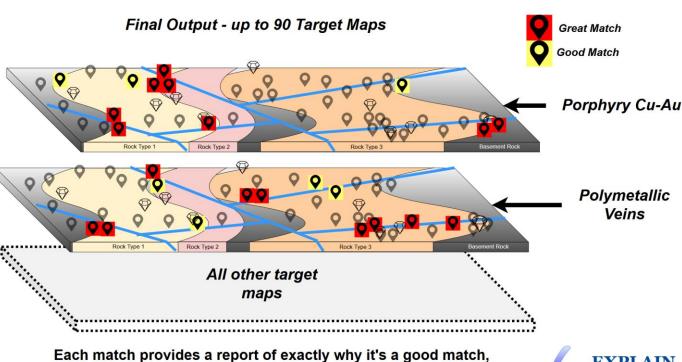
A company wants to conduct greenfields or brownfields exploration and wants to find new mineral targets

SOLUTION

Minerva's TARGET software uses Al to provide an interactive auditable webmap, providing hundreds of deposit-specific models, explanations of results, and expert advice on next steps

ERRA MINING AI





what the weights are, and where the input data is sourced from.



EXPLAIN

It also gives the user advice on what attributes would improve or worsen the match, allowing users to interact dynamically with the system as they collect new information.



ADVISE



TARGET DEMO VIDEO (6min)





SOLACE is an integrated service that takes raw domain data and builds an infrastructure to align current and future data to chosen standards and make the data analytics-ready.

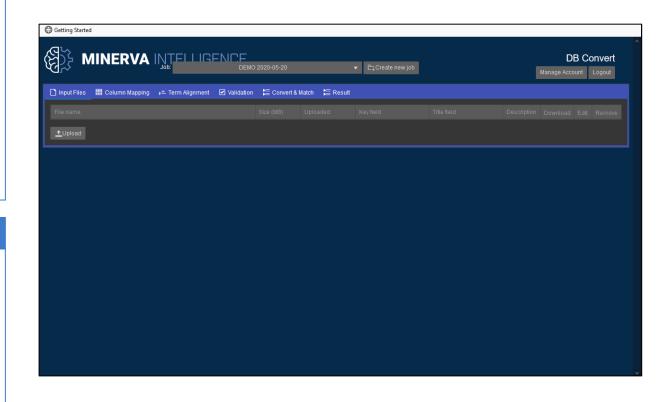
- SOLACE is meant for companies that routinely handle streams of poorly controlled data
- Traditionally this data is manually cleaned by employees to a minimum level of quality to suit the use case before being sent to a centralized database. Each time a new project is acquired or created, this inefficient manual process is repeated, wasting time and effort.
- SOLACE provides organizations the means to choose a standard, define the terms they need to use, convert legacy data to the standard, and implement an alignment process to automatically convert new data.

Benefits

- Formalizes a necessary process that is often done ad-hoc
- Produces harmonized streams of data that remove the data cleaning burden from database managers
- The system remembers historic alignments and improves over time
- Individual employees and stakeholders on the data-creation stage do not have to change the words they prefer, so long as they continue to use them the same way. This avoids the problem of the top-down imposition of standards, which leads to limited adoption.

SOLACE Interface:

Cloud-based SaaS platform



DRILLING DOWN



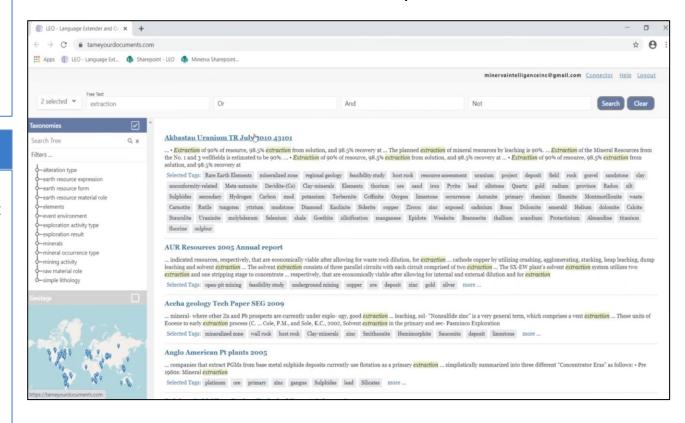
LEO is a semantics-based system for managing an organization's digital knowledge assets.

- The LEO system provides users with rapid, intelligent discovery of company documents by indexing these documents against a standards-based knowledge graph and a company-based document library.
- These standards-based knowledge graphs are created and maintained by Minerva and the company-based document library can be maintained by Minerva or by the company.

Benefits

- Existing company staff can keep track of cross-related documents and new staff can quickly track cross-related documents they did not know existed
- By embracing and indexing on international terminology standards, companies can enhance the value and interoperability of their digital knowledge base.
- A company's entire data library can now be plumbed for new insights, potentially providing new opportunities.
- · Massive cost savings from eliminating inefficient document search

LEO Interface: Cloud-based SaaS platform



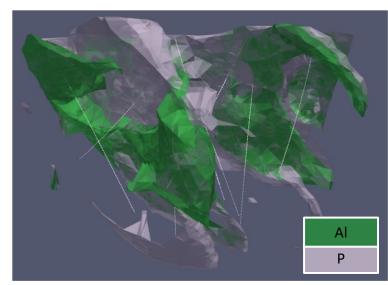


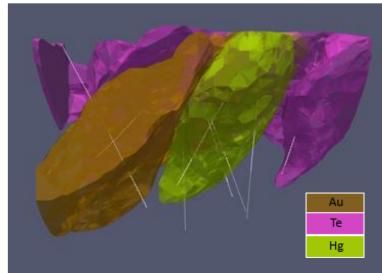
3D Analysis of Multi-Element Data

- Analyzes multi-element drilling data, then applies spatial and geostatistical methods to produce hundreds of 3D volumes for the full suite of elements
- Ideally used to identify spatial distribution of different element groups for exploration and geo-metallurgy purposes
- Uses Minerva's AI technology to identify and index key zones and compares DRIVER results to mineral deposit knowledge, providing explanations and advice

Benefits

- Unique workflow and software allows DRIVER to evaluate datasets earlier in the mining value chain
- Semi-quantitative, looking at patterns and coincidence
- Able to find new insights in massive amounts of data, potentially finding lucrative new opportunities in welltrodden areas.





						_		n:	•	6 1	_	_		_	_	_					Mn_pp
	Ag_ppm .						Ba_ppm				Co_ppm									Mg_ppm	
Ag_ppm		25%	42%	6%	6%	0%	5%	40%	28%	43%	21%	14%	25%	25%	25%	32%	2%	32%	6%	25%	
Al_ppm	25%		16%	3%	3%	9%	33%	14%	29%	27%	21%	10%	25%	25%	28%	45%	0%	25%	10%	24%	41%
As_ppm	44%	17%		18%	18%	2%	7%	19%	40%	45%	31%	24%	26%	26%	35%	33%	5%	15%	8%	40%	40%
Au_ppb	13%	6%	36%		100%	22%	2%	6%	42%	<u>8</u> %	46%	30%	31%	31%	47%	8%	18%	20%	7%	45%	30%
Au_ppm	13%	6%	36%	100%		22%	2%	6%	42%	8%	46%	30%	31%	31%	47%	8%	18%	20%	7%	45%	30%
B_ppm	0%	38%	8%	45%	45%		1%	0%	42%	1%	46%	13%	17%	17%	37%	1%	0%	14%	0%	42%	18%
Ba_ppm	5%	33%	6%	1%	1%	0%		29%	4%	14%	2%	16%	17%	17%	0%	18%	10%	39%	65%	0%	11%
Bi_ppm	42%	14%	19%	3%	3%	0%	30%		14%	12%	16%	24%	12%	12%	14%	14%	0%	22%	43%	15%	14%
Ca_ppm	28%	29%	39%	20%	20%	10%	4%	14%		36%	83%	59%	43%	43%	84%	20%	0%	1%	0%	92%	89%
Cd_ppm	44%	28%	44%	4%	4%	0%	15%	12%	37%		35%	27%	30%	30%	34%	32%	0%	24%	8%	37%	40%
Co_ppm	21%	21%	30%	22%	22%	10%	2%	15%	83%	34%		63%	49%	49%	85%	16%	1%	0%	0%	86%	75%
Cr_ppm	14%	10%	24%	15%	15%	3%	17%	24%	61%	28%	66%		47%	47%	57%	8%	9%	13%	18%	63%	60%
Cu_pct	26%	25%	25%	15%	15%	4%	18%	12%	43%	29%	49%	45%		100%	41%	21%	0%	12%	1%	44%	40%
Cu_ppm	26%	25%	25%	15%	15%	4%	18%	12%	43%	29%	49%	45%	100%		41%	21%	0%	12%	1%	44%	40%
Fe_ppm	25%	28%	34%	23%	23%	9%	0%	13%	84%	33%	86%	56%	42%	42%		23%	1%	1%	0%	89%	81%
Ga_ppm	38%	51%	36%	4%	4%	0%	21%	16%	23%	36%	18%	9%	24%	24%	27%		0%	29%	17%	21%	36%
Hg_ppm	8%	0%	20%	37%	37%	0%	42%	2%	0%	2%	3%	37%	1%	1%	4%	2%		52%	73%	4%	2%
K_ppm	32%	25%	14%	9%	9%	3%	39%	21%	1%	23%	0%	12%	12%	12%	1%	25%	12%		49%	0%	5%
La_ppm	7%	10%	8%	3%	3%	0%	66%	42%	0%	8%	0%	18%	1%	1%	0%	15%	18%	50%		0%	3%

Encompassed By

Coincident

Overlapping

Separate

Completely Separate



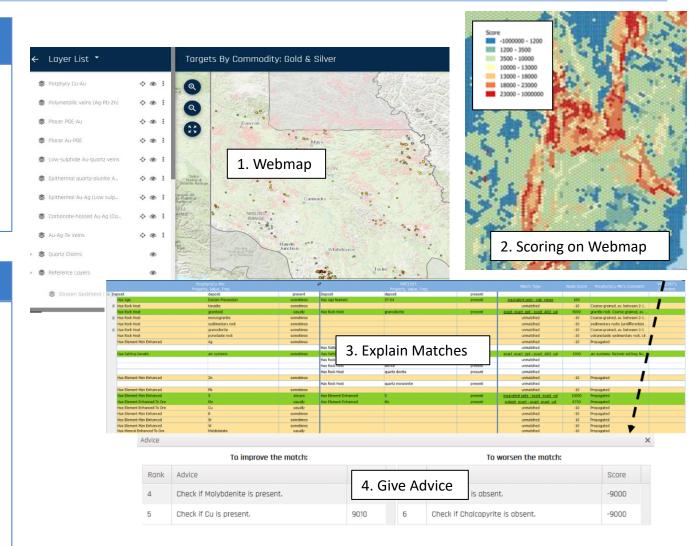


Mineral Target Maps

- Focused on provincial to country-scale Mineral Target
 Prospectivity Maps for mineral exploration... but can be applied to smaller claim areas for junior mining companies
- End product is an AI-powered interactive mineral target map that is auditable and provides explanations and advice to users

Benefits

- Able to use and interpret large datasets with multiple generations of data
- 90x faster than traditional exploration process
- Combines machine intelligence with human intelligence to reach conclusions much faster than any geologist could. The system also provides explanations needed to trust the results.



TERRA MINING AI



SOLACE

- · Cleaned and audited data in the original format or the format of your choosing
- Controlled vocabulary for all your data types
- Optional: knowledge graphs for management of vocabulary and data
- Optional: alignment tool for future data
- Produces cleaned and standardized data outputs
- The system remembers historic alignments and improves over time
- · Vocabularies are managed and data is transformed as the system learns to fix typos, alternative labels and legacy codes
- Data is ready for machine learning or other AI applications



- Cloud or premise-based search program.
- Included: Standard taxonomies
- Optional: customized taxonomies
- · Advanced search functionality in an easy to use interface
- · Automated tagging and geotagging of geology documents
- Optional: LEO Pro (on-premise)
- Efficiently find your documents
- Document library is automatically tagged, with advanced search functionality
- Standardized and customized taxonomies allow for rapid finding and sharing of large volumes of data
- System handles alternative labels, misspelling and historic data

DRIVER

- 3D analysis of multi-element zones
- · Wireframes of multi-element zones
- Detailed report on the geochemical statistics and spatial multi-element zones
- Data can be viewed in Leapfrog or downloaded as shapefiles

TARGET

- Access to Minerva's proprietary Al technology
- Shapefiles with 100-1000's of new geological targets
- Explanations on why Targets were chosen
- Advice on what your next exploration steps can be

- Workflow and software allows **DRIVER** to evaluate datasets earlier in the mining value chain
- Able to use existing data to make new interpretations
- Semi-quantitative, looking at patterns and coincidence

- Able to use and interpret large data sets with multiple generations of data
- Combines machine intelligence with human intelligence to reach conclusions faster than geologists ever could.
- The system provides explanations needed to trust the results





301 - 850 West Hastings Street Vancouver, British Columbia Canada V6C 1E1

604.620.1051

minervaintelligence.com info@minervaintelligence.com